

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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ASSISTANT COMMISSIONER FOR PATENTS

Washington, D.C. 20231

Attorney's Docket Number: 6530.0008-03

Prior Application:

Art Unit: 3309Examiner: Unknown

SIR: This is a request for filing a

Continuation Divisional Application under 37 C.F.R. § 1.53(b) of pending prior application Serial No. 08/806,386 filed February 27, 1997 of Charles R. SLATER for BIPOLAR ENDOSCOPIC SURGICAL SCISSOR BLADES AND INSTRUMENT INCORPORATING THE SAME.

1. Enclosed is a complete copy of the prior application including the oath or Declaration and drawings, if any, as originally filed. I hereby verify that the attached papers are a true copy of prior application Serial No. 08/806,386 as originally filed on February 27, 1997.
2. Enclosed is a substitute specification under 37 C.F.R. § 1.125.
3. Cancel Claims 2-39.
4. A Preliminary Amendment is enclosed.
5. The filing fee is calculated on the basis of the claims existing in the prior application as amended at 3 and 4 above.

For	: Number Filed	: Number Extra	: Rate	: Basic Fee
Total	:	:	:	\$690.00
Claims	: 12 -20=	: 0	: x\$ 22.00=	\$0
Independent	:	:	:	
Claims	: 1 - 3=	: 0	: x\$ 82.00=	0
Multiple Dependent Claim(s) (if applicable)			: +\$270.00=	
			Total	= : \$690.00
			Reduction by 1/2 for	
			filing by small entity	
			TOTAL FILING FEE	= : \$690.00

6. A check in the amount of \$ to cover the filing fee is enclosed.
7. With the exception of the filing fee of this application, the Commissioner is hereby authorized to charge any fees which may be required including fees due under 37 C.F.R. § 1.16 and any other fees due under 37 C.F.R.

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U.S. PATENT AND TRADEMARK OFFICE
1000 LEAVITT ROAD, BLDG. 100
SUITE 100
WILMINGTON, DE 19801-1598

LAW OFFICES
FINNEGAN, HENDERSON,
FARABOW, GARRETT,
& DUNNER, L.L.P.
1300 I STREET, N.W.
WASHINGTON, D.C. 20005
202-408-4000

§ 1.17, or credit any overpayment during the pendency of this application to Deposit Account No. 06-0916, Applicant awaits a Notice to File Missing Parts of Application before paying the filing fee.

8. Amend the specification by inserting before the first line, the sentence:
--This is a continuation division of application Serial No. 08/806,386, filed February 27, 1997, which is a division of application Serial No. 08/354,992, filed December 13, 1994.

9. New formal drawings are enclosed.

10. The prior application is assigned of record to: Symbiosis Corporation, as evidenced by the Assignment recorded at Reel 7284, Frame 0786.

11. Priority of application Serial No. _____, filed on _____ in _____ (country) is claimed under 35 U.S.C. § 119. A certified copy
 is enclosed or is on file in the prior application.

12. A verified statement claiming small entity status
 is enclosed or is on file in the prior application.

13. The power of attorney in the prior application is to, among others, Albert J. Santorelli, Reg. No. 22,610.

14. The power appears in the original declaration of the prior application.

15. Since the power does not appear in the original declaration, a copy of a Revocation of Power of Attorney and Power of Attorney filed in the prior application is enclosed.

16. Please address all correspondence to FINNEGAN, HENDERSON, FARABOW, GARRETT and DUNNER, L.L.P., 1300 I Street, N.W., Washington, D.C. 20005-3315.

17. Recognize as associate attorneys: Barbara C. McCurdy, Reg. No. 31,120; Leslie I. Bookoff, Reg. No. 38,084; Susanne C. Tinker, Reg. 44,472, Finnegan, Henderson et al., 1300 I Street NW, Washington, D.C. 20005-3315.

18. Also enclosed is _____

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FINNEGAN, HENDERSON,
FARABOW, GARRETT,
& DUNNER, L.L.P.
1300 I STREET, N.W.
WASHINGTON, D.C. 20005
202-408-4000

PETITION FOR EXTENSION. If any extension of time is necessary for the filing of this application, including any extension in the parent application, serial no. 08/806,386, filed February 27, 1997, for the purpose of maintaining copendency between the parent application and this application, and such extension has not otherwise been requested, such an extension is hereby requested, and the Commissioner is authorized to charge necessary fees for such an extension to our Deposit Account No. 06-0916. A duplicate copy of this paper is enclosed for use in charging the deposit account.

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Date: January 18, 2000

By: Albert Santorelli by Suzanne C. Tinker
Albert J. Santorelli Reg. No. 44,472
Reg. No.: 22,610

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FINNEGAN, HENDERSON,
FARABOW, GARRETT,
& DUNNER, L.L.P.
1300 I STREET, N.W.
WASHINGTON, D.C. 20005
202-408-4000

PATENT
Attorney Docket No. 6530.0008-03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Charles R. SLATER

Rule 53(b) Divisional of:

Serial No.: 08/806,386

Filed: January 18, 2000

For: BIPOLAR ENDOSCOPIC
SURGICAL SCISSOR BLADES
AND INSTRUMENT
INCORPORATING THE SAME

Parent Information:

Group Art Unit: 3309

Examiner: Unknown

**Assistant Commissioner for Patents
Washington, D.C. 20231**

Sir:

PRELIMINARY AMENDMENT

Prior to the examination of the above application, please amend this application as follows:

IN THE CLAIMS:

Please cancel claim 1 and add the following new claims:

--40. An electrosurgical cutting device comprising an instrument body, first and second cutting blades at least one of which is pivotally mounted on the body to execute a scissor action with respect to the other blade, and electrical supply conductors associated with the body for supplying an electrosurgical voltage to the first and second blades, wherein the first blade is a composite blade comprising a conductive outer

electrode, an inner conductive layer and, sandwiched between the outer electrode and the inner layer, an insulating layer, the supply conductors being connected respectively to the outer electrode and to the inner layer.

41. A device according to claim 40, wherein one of the supply conductors is connected directly to the inner layer.

42. A device according to claim 40, wherein one of the supply conductors is coupled to the second blade and is electrically connected to the inner layer of the composite first blade by electrical contact between the second blade and the inner layer.

43. A device according to claim 42, wherein the second blade has a conductive body which is in electrical contact with the inner layer of the composite first blade, and wherein said one supply conductor is connected to the conductive body so that the conductive body is electrically connected in series between said one supply conductor and the inner layer.

44. A device according to claim 40, wherein each blade has a cutting edge which is so oriented that the blades can execute a progressive shearing action, each cutting edge being formed of a metallic material.

45. A device according to claim 40, wherein the second blade has an entirely metallic body and its cutting edge is formed on the metallic body.

46. A device according to claim 40, wherein both blades are pivotally mounted on the instrument body.

47. A device according to claim 40, wherein each blade comprises an elongate member having an outer surface, an inner shearing surface, and a cutting edge running along the blade and defining a boundary between the shearing surface and the outer surface along one side of the shearing surface, wherein the blades are so mounted on the instrument body that their respective cutting edges execute a progressive shearing action as the blades are moved to a closed configuration with the shearing surfaces in a face-to-face relationship, wherein the outer surface of the composite first blade defines a cutting face running along the blade adjacent to its cutting edge, each of the inner conductive layer, the insulating layer and the outer electrode being exposed along the cutting face with the shearing surface being formed, at least adjacent to the cutting edge, on the inner conductive layer.

48. A device according to claim 47, wherein the second blade has a conductive body and also has a cutting face running along the blade adjacent to its cutting edge, the conductive body being exposed at least at the cutting edge and along the cutting face.

49. A device according to claim 48, wherein the conductive body of the second blade is exposed over at least a major part of the shearing surface of that blade.

50. A device according to claim 47, wherein the outer electrode, the insulating layer and the inner conductive layer of the composite first blade are each exposed along an electrosurgical cutting surface which forms part of said outer surface of the composite first blade running along that blade adjacent to the shearing surface of that blade.

51. A device according to claim 50, wherein the electrosurgical cutting surface extends along the composite first blade adjacent to the opposite side of the shearing surface of that blade from the cutting edge, and wherein the blades are so shaped and mounted that, in their closed configuration, the cutting edge of the second blade runs along the shearing surface of the composite first blade and is spaced from the composite first blade electrosurgical cutting surface.--

REMARKS

By this Preliminary Amendment, Applicant has canceled claim 1 and added new claims 40-51. New claims 40-51 copy claims 1-12 of U.S. Patent No. 5,860,975, issued on January 19, 1999. Applicant requests examination of pending claims 40-51.

If there is any fee due in connection with the filing of this Preliminary
Amendment, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

By: Leslie Bookoff by Susanne C. Miller
Leslie I. Bookoff Reg. No. 44,472
Reg. No. 38,084

Dated: January 18, 2000

LAW OFFICES
FINNEGAN, HENDERSON,
FARABOW, GARRETT,
& DUNNER, L.L.P.
1300 I STREET, N.W.
WASHINGTON, D.C. 20005
202-408-4000

BIPOLAR ENDOSCOPIC SURGICAL SCISSOR BLADES AND INSTRUMENT
INCORPORATING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to endoscopic surgical instruments. More particularly, the invention relates to an endoscopic surgical instrument having end effectors made out of a combination of conductive and non-conductive materials. The invention has particular use with respect to bipolar endoscopic cautery. For purposes herein, the term "endoscopic instruments" is to be understood in its broadest sense to include laparoscopic, arthroscopic, and neurological instruments, as well as instruments which are inserted through an endoscope.

2. State of the Art

Endoscopic surgery is widely practiced throughout the world today and its acceptance is growing rapidly. In general, endoscopic/laparoscopic surgery involves one or more incisions made by trocars where trocar tubes are left in place so that endoscopic surgical tools may be inserted through the tubes. A camera, magnifying lens, or other optical instrument is often inserted through one trocar tube, while a cutter, dissector, or

other surgical instrument is inserted through the same or another trocar tube for purposes of manipulating and/or cutting the internal organ. Sometimes it is desirable to have several trocar tubes in place at once in order to receive several surgical instruments. In this manner, organ or tissue may be grasped with one surgical instrument, and simultaneously may be cut with another surgical instrument; all under view of the surgeon via the optical instrument in place in the trocar tube.

Various types of endoscopic surgical instruments are known in the art. These instruments generally comprise a slender tube containing a push rod which is axially movable within the tube by means of a handle or trigger-like actuating means. An end effector is provided at the distal end of the tube and is coupled to the push rod by means of a clevis so that axial movement of the push rod is translated to rotational or pivotal movement of the end effector. End effectors may take the form of scissors, grippers, cutting jaws, forceps, and the like. Because of their very small size and the requirements of strength and/or sharpness, end effectors are difficult to manufacture and are typically formed of forged stainless steel. As such, they form an expensive portion of the endoscopic instrument.

Modern endoscopic procedures often involve the use of electrocautery, as the control of bleeding by coagulation during

surgery is critical both in terms of limiting loss of blood and in permitting a clear viewing of the surgical site. As used herein, cautery, electrocautery, and coagulation are used interchangeably. Several types of electrocautery devices for use in endoscopic surgery are described in the prior art. Monopolar electrosurgical instruments employ the instrument as an electrode, with a large electrode plate beneath and in contact with the patient serving as the second electrode. High frequency voltage spikes are passed through the instrument to the electrode (i.e., end effector) of the endoscopic instrument to cause an arcing between the instrument and the proximate tissue of the patient. The current thereby generated continues through the patient to the large electrode plate beneath the patient. Monopolar cautery has the disadvantage that the current flows completely through the patient. Because control of the current path through the body is not possible, damage can occur to tissue both near and at some distance from the surgical site. In addition, it has been observed that monopolar cautery can result in excessive tissue damage due to the arcing between the end effector and the tissue.

In order to overcome the problems associated with monopolar cautery instruments, bipolar instruments have been introduced. In bipolar electrosurgical instruments, two electrodes which are closely spaced together are utilized to contact the tissue. Typically, one end effector acts as the first electrode, and the

other end effector acts as the second electrode, with the end effectors being electrically isolated from each other and each having a separate current path back through to the handle of the instrument. Thus, in a bipolar instrument, the current flow is from one end effector electrode, through the tissue to be cauterized, to the other end effector electrode.

Various endoscopic instruments with cautery capability are known in the art. U.S. Patent Number 4,418,692 to Guay, for example, discloses a device for use in laparoscopic tubal cauterization for blocking the Fallopian tubes of a patient. The device comprises a substantially tubular body member having a spring-biased piston slidably mounted therein. A pair of electrodes (either monopolar or bipolar) are disposed to grasp living tissue when the piston is in a first position biased by the spring and to release the tissue when a button is pressed which moves the piston into a second position. The device includes a circuit breaker which interrupts current flowing to the electrodes when the piston is in the second position. When the electrodes grasp the tissue, however, current is supplied to the entire surface of the electrode, that is, both the grasping surface and the outer non-grasping surface.

Another electrosurgical instrument for use in combination with an endoscope is disclosed in U.S. Patent Number 5,007,908 to

Rydell for "Electrosurgical Instrument Having Needle Cutting Electrode and Spot-Coag Electrode". Rydell's device includes an elongated flexible tubular member with a plurality of lumens. The distal end of the tubular member is provided with a bullet shaped ceramic tip covered with a conductive layer and having an opening coupled to a first one of the lumens. The conductive layer is coupled to a conductor which extends through a second one of the lumens to an electrical source. A second conductor, also coupled to the electrical source is slidably through the first lumen by a plunger. The two electrodes form a bipolar pair. In a second embodiment, the conductive layer on the ceramic tip is split by an insulating gap and both halves of the tip form a bipolar pair of electrodes. As with the Guay device, above, substantially the entire distal surface of Rydell's device serves as an electrode when energized.

Several hemostatic bipolar electrosurgical scissors have also been described. U.S. Patent #3,651,811 to Hildebrandt describes a bipolar electrosurgical scissors having opposing cutting blades forming active electrodes. The described scissors enables a surgeon to sequentially coagulate the blood vessels contained in the tissue and then to mechanically sever the tissue with the scissor blades. In particular, with the described bipolar electrosurgical scissors, the surgeon must first grasp the tissue with the scissor blades, energize the electrodes to cause

hemostasis, de-energize the electrodes, and then close the scissor blades to sever the tissue mechanically. The scissors are then repositioned for another cut accomplished in the same manner. With the bipolar electrosurgical scissors of Hildebrandt, the surgeon cannot maintain the electrodes in a continuously energized state because the power supply would be shorted out and/or the blades damaged if the blades are permitted to contact each other while energized.

The disadvantages of the bipolar scissors of Hildebrandt are overcome by the disclosure in U.S. Patent Nos. 5,324,289 and 5,330,471 to Eggers. In its preferred embodiment, the bipolar electrosurgical scissors of Eggers comprise a pair of metal scissor blades which are provided with an electrically insulating material interposed between the shearing surfaces of the blades so that when the scissor blades are closed, the metal of one blade never touches the metal of the other blade; i.e., the insulating material provides the cutting edge and the shearing surface. With the arrangement provided by Eggers, a cautery current will pass from the top back edge of the bottom metal blade through the tissue which is to be cut and to the bottom back edge of the top metal blade directly in advance of the cutting action. As the scissors are gradually closed, the hemostasis preferentially occurs at a location just in advance of the cutting point which itself moves distally along the insulated cutting edges of the

blades in order to sever the hemostatically heated tissue. With this arrangement, the scissors may be maintained in a continuously energized state while performing the cutting. The Eggers patent describes various alternative embodiments of the bipolar scissors, including the use of metal blades with only one blade being insulated on its shearing surface, and the use of insulating blades with back surfaces coated with metal.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide a pair of scissor blades for a bipolar cauterizing surgical scissors which provide a metal on metal cutting/shearing action.

It is another object of the invention to provide a pair of scissor blades for a bipolar cauterizing surgical scissors which have shearing surfaces that are insulated from cautery surfaces.

It is also an object of the invention to provide an endoscopic bipolar cauterizing scissors which provides a metal on metal cutting action and which may be either curved or flat.

In accord with the objects of the invention, the scissor blades of the present invention are comprised of an electrically conductive electrode, an electrically insulating material, and a

metal shearing surface which is electrically insulated and physically spaced from the electrode by the insulating material which is disposed therebetween. The scissor blades, for example, may comprise but are not limited to a composite assembly of an electrode layer, an insulating layer, and a metal shearing surface layer. In the presently preferred embodiment, the electrode layer is a metal blade which is typically constructed from stainless steel, while the insulating layer is a ceramic which is deposited, bonded, or otherwise fixed on the metal blade, and the metal shearing surface layer which also provides the cutting edge is a metal (e.g., copper, gold, stainless steel etc.) which is metalized, deposited, sputtered, plated, bonded, or otherwise fixed onto the ceramic. In a second embodiment, the insulating layer is a ceramic support, with the electrode layer and the metal shearing surface layer being metalized, deposited, sputtered, plated, bonded, or otherwise fixed to the ceramic support. In a third embodiment, the insulating layer is deposited, bonded, or otherwise fixed onto a metal blade which includes the cutting edge and shearing surface, while the electrode metal layer is metalized, deposited, sputtered, plated, bonded, or otherwise fixed onto the insulating layer. In a fourth embodiment, the insulating layer is a composite material such as fiberglass which is provided with metal electrode and metal shearing surface layers which are metalized, deposited, sputtered, plated, bonded, or otherwise fixed onto opposite sides of the fiberglass layer. In

all embodiments, since the metal cutting edges and shearing surfaces are insulated from the electrodes, no short circuit can form between the electrodes even though the cutting edges and shearing surfaces are metal.

As the scissor blades are intended for use as part of an endoscopic instrument, each blade is preferably provided with a first hole which receives an axle or clevis pin around which the blades rotate. In addition, each blade is preferably provided with a pin or protrusion extending from a proximal or base portion of the blade. The pins are provided to receive links which couple the blades to an actuator mechanism.

The endoscopic bipolar cautery scissors instrument which utilizes the blades of the invention is substantially as is described in copending application U.S. Serial No. 08/284,793, the complete disclosure of which is hereby incorporated by reference herein, and utilizes a push rod assembly with two conductive push rods which are stabilized and insulated relative to each other. The distal ends of the push rods are coupled to the end effectors by the links. The proximal ends of the push rods extend through the handle and lever of the scissors instrument and present electrical cautery pins onto which a standard bipolar cautery plug can be mated. ...

Additional objects and advantages of the invention will become apparent to those skilled in the art upon reference to the detailed description taken in conjunction with the provided figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a broken side elevation view in partial section of an endoscopic bipolar scissors instrument according to the invention;

Figure 2 is a broken top view in partial section of the instrument of Figure 1;

Figure 3 is an enlarged broken side elevation view in partial section of the distal end of the instrument of Figure 1;

Figure 3a is an enlarged broken top view in partial section of the distal end of the instrument of Figure 1;

Figure 4 is a view similar to Figure 3a of a second embodiment of a distal push rod collar;

Figure 4a is a side elevation view of the collar of Figure 4;

Figure 4b is a distal end view of the collar of Figure 4a;

Figure 4c is a proximal end view of the collar of Figure 4a;

Figure 5 is an enlarged top view of a first embodiment of scissor blades according to the invention;

Figure 6 is a cross sectional view of the scissor blades of Figure 5 taken along lines 6-6 and shown in their operating positions;

Figure 7 is a view similar to Figure 6 but showing one of the scissor blades of Figures 5 and 6 in use with a conventional scissor blade in an alternative first embodiment;

Figure 8 is a view similar to Figure 5 of a second embodiment of the scissor blades according to the invention;

Figure 9 is a cross sectional view of the scissor blades of Figure 8 taken along lines 9-9 and shown in their operating positions;

Figure 10 is a view similar to Figures 5 and 8 of a third embodiment of the scissor blades according to the invention;

Figure 11 is a cross sectional view of the scissor blades of Figure 10 taken along lines 11-11 and shown in their operating positions;

Figure 12 is a view similar to Figures 5, 8, and 10 of a fourth embodiment of the scissor blades according to the invention; and

Figure 13 is a cross sectional view of the scissor blades of Figure 12 taken along lines 13-13 and shown in their operating positions.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to Figures 1 through 3a, an endoscopic bipolar scissors instrument 10 includes a proximal handle 12 with a manual lever actuator 14 pivotally coupled to the handle by a pivot pin 15. A hollow stainless steel tube 16 is rotatably coupled to the handle 12 and is preferably rotatable about its longitudinal axis relative to the handle 12 through the use of a ferrule 18 such as described in detail in previously incorporated copending application Serial Number 08/284,793. A push rod assembly 20 extends through the hollow tube 16 and is coupled at its proximal end 22 to the manual lever actuator 14 as described in more detail in copending application Serial Number 08/284,793. The distal end

of the tube 16 has an integral clevis 24 within which a pair of scissor blades 26, 28 are mounted on an axle screw 30. The distal end 23 of the push rod assembly 20 is coupled to the scissor blades 26, 28 so that reciprocal movement of the push rod assembly 20 relative to the tube 16 opens and closes the scissor blades 26, 28. It will be appreciated that the reciprocal movement of the push rod assembly 20 relative to the tube 16 is effected by movement of the manual lever actuator 14 relative to the handle 12.

The presently preferred embodiment of the push rod assembly 20 includes a pair of stainless steel rods 32, 34 which are molded into a proximal collar 36 and captured in a distal collar 46. The proximal collar has a radial groove 40 in its distal portion and an increased diameter proximal portion 37 which carries a pair of electrical coupling pins 39 which are electrically coupled to the rods 32, 34. As shown, the pins 39 are spaced farther apart from each other than the rods 32, 34 so as to accommodate a standard cautery connector. The rods 32, 34 are covered with insulating high density polyethylene (HDPE) tubes along substantially their entire length between the proximal and distal collars 36, 46. A plurality of spaced apart polypropylene cylinders 50 are molded about the rods between the proximal collar 36 and the distal collar 46. These cylinders stabilize the rods against helical

twisting when the tube 16 is rotated and, by being discontinuous, prevent against warping of the push rod assembly.

According to one embodiment, and as seen best in Figures 3 and 3a, the distal collar 46 is made from two ceramic pieces 46a, 46b which are snap fit and bonded to each other. A pair of clevis insulators 76 are placed in the clevis as shown in Figure 3a. Each clevis insulator 76 has a proximal side slot 76a and a distal bushing hole 76b. The collar 46 has a pair of guiding wings 47, 49 which engage slots 76a in the clevis insulators 76. The electrically conductive rods 32, 34 exit the distal collar 46 through opposite sides at substantially right angles. The distal ends of the rods 32, 34 are mechanically and electrically coupled to the respective blades 26, 28 by respective electrically conductive links 99.

According to a presently preferred embodiment, and as best seen in Figures 4, 4a, 4b, and 4c, a distal collar 146 is a single ceramic unit which is substantially circular in cross section except for upper and lower projections 147, 149. These projections engage the space between arms 24a, 24b of the clevis 24 and prevent the collar 146 from rotating in the clevis 24 and from passing beyond the proximal end 24c of the clevis 24. Consequently, the projections each have a pair of substantially parallel edges 147a, 147b, 149a, 149b and a rounded proximal edge

147c, 149c. The collar 146 has a pair of push rod receiving channels 150, 152 for receiving the push rods 32, 34 respectively. The channels have portions 150a, 152a which are radially open to the surface of the collar 146 from the proximal end thereof to a point approximately half way under the projections 147, 149. The channels 150, 152 terminate under the projections 147, 149 with a right angle bend 150b, 152b. A radial opening 150c, 152c extends proximally along each side of the collar from the right angle bend 150b, 152b to a point contiguous with the radially open part 150a, 152a of the channels 150, 152. The radial openings 150c, 152c are each substantially orthogonal to the radially open parts 150a, 152a. The distal end of the collar 146 has a pair of ramped slot openings 154, 156 which terminate at their proximal ends with substantially semi-circular grooves 158, 160. The slot openings and grooves are provided to accommodate the ends of links 99 (see Figures 1 and 3) for coupling the distal ends of the push rods 32, 34 to scissor blades. The collar 146 is easily attached to the distal ends of the push rods 32, 34 by pressing the push rods into the radially open parts 150a, 152a of the channels 150, 152 so that the bent ends of the push rods enter the radial openings 150c, 152c. The push rods and/or the collar 146 are pushed towards each other so that the bent ends of the push rods abut the right angle bends 150b, 152b in the channels 150, 152, at which location the links 99 are coupled to the push rods.

Referring now to a first embodiment of the scissor blade invention seen in Figures 5 and 6, the first scissor blade 26 has a distal portion 26a, a lower proximal tang 26c, and a mounting hole 26d therebetween. A connecting lug 26e extends orthogonally outward from the surface of the tang 26c in a first direction. As shown in Figures 5 and 6, the distal portion 26a includes an lower cutting edge 26b and an inner surface 26f (also called the shearing surface). Behind the inner surface 26f of the first scissor blade is an insulating layer 26r, and a conducting electrode layer 26q. The opposed second scissor blade 28 is configured similarly to the first scissor blade and has a distal portion 28a, an upper proximal tang 28c, and a mounting hole 28d therebetween. A connecting lug 28e extends orthogonally from the surface of the tang 28c in a second direction which is opposite to the first direction mentioned above. The distal portion 28a includes an upper cutting edge 28b and an inner surface 28f. Behind the inner surface 28f of the second scissor blade 28 is an insulating layer 28r, and a conducting electrode layer 28q.

According to the first embodiment shown in Figures 5 and 6, both scissor blade assemblies 26 and 28 are laminated assemblies which include a metal support (also called a metal blade support) 26q, 28q, an intermediate electrically insulative layer 26r, 28r and a metal blade or face 26f, 28f defining a shearing surface. It will be appreciated that the metal faces 26f, 28f are

preferably provided with sharpened opposed cutting edges 26b, 28b. The metal blade supports 26q, 28q form the electrically conductive portions (i.e., the electrodes) of the scissor blades through which cautery current is applied. In this regard, substantially the entire lengths of blade supports 26q, 28q are conductive, including the proximal lugs 26e which make electrical connection with the respective rods 32, 34 via links 99 as described above with reference to Figures 3-4c. As seen in Figure 6, the preferential path of current flow "E" is through the metal support portions 26q, 28q of the scissor blades which are insulated from the cutting edges 26b, 28b and the shearing surfaces (faces) 26f, 28f of the blades. Because of this arrangement, cautery and coagulation current may be applied continuously throughout the cutting/shearing procedure since the contact of the cutting edges and shearing surfaces of the blades will not short circuit the device.

The embodiment shown in Figure 5 and 6 may be manufactured by first laminating machined or cast stainless steel, superalloy, bronze or other conductive metal blade supports 26q, 28q with the insulating layers 26r, 28r such as by gluing, glazing, spraying, depositing, firing, or otherwise fixing a ceramic to the inner surfaces of blade supports 26q, 28q. The metal faces 26f, 28f having the cutting edges and shearing surfaces may then be applied by gluing, sputtering, metalizing, thermal spraying, plating, or

otherwise fixing the metal layers 26f, 28f onto the insulating layers 26r, 28r. The edges 26b, 28b may be sharpened after the laminating process is completed. The insulating layers may advantageously be made of an aluminum-oxide or another ceramic, and a nickel/aluminum coating may be advantageously applied to the blade supports to aid in bonding the aluminum-oxide ceramic insulating layers to the metallic blade supports.

From the foregoing, it will be appreciated that in order to achieve the object of preventing the cutting edges and shearing surface from short circuiting the device, it is only necessary that one of the scissor blades be constructed as described above. Figure 7 shows an alternative to the first embodiment of the invention where one of the blades 26 of the first embodiment is used in conjunction with a conventional scissor blade 128 which is entirely conductive. In this embodiment and in the embodiments described below, similar reference numerals refer to similar elements of the embodiments. As illustrated in Figure 7, the preferential path of current flow "E" is through the metal support portion 26g of blade 26 to the shearing surface 128f and/or cutting edge 128b of the scissor blade 128.

Figures 8 and 9 show a second embodiment of scissor blades 226, 228. According to this embodiment, both scissor blades 226 and 228 are laminated assemblies which include a blade support

226q', 228q', which itself is a laminated sub-assembly of a non-conductive core support 226r, 228r and an outer metallic layer support 226q, 228q. A metal blade layer or face 226f, 228f defining a shearing surface is laminated to the inner surface of the non-conductive core 226r, 228r. It will be appreciated that the metal blade layers 226f, 228f are preferably provided with sharpened opposed cutting edges 226b, 228b. The outer metallic layers 226q, 228q of the blade supports 226q', 228q' form the electrode portions of the blades through which cautery current is applied. As seen best in Figure 8, the outer metallic layers 226q, 228q extend along substantially the entire length of the blades (over the non-conductive cores 226r, 228r) to make an electrical connection with a source of cautery at the proximal connecting lugs 226e, 228e of the blades. As seen in Figure 9, the path of preferential current flow "E" is through the electrode portions 226q', 228q' of the blades which are insulated from the cutting edges and the shearing surfaces of the blades. Because of this arrangement, cautery current may be applied continuously throughout the cutting procedure since the contact of the shearing surfaces of the blades will not short circuit the device.

The embodiment shown in Figures 8 and 9 may be manufactured by molding ceramic cores 226r, 228r and laminating both the inner and outer surfaces with metal by gluing, sputtering, metalizing, thermal spraying, plating, etc. the metal layers onto the ceramic

cores. In this case, the ceramic material should preferably be formed with a flange type cross section as denoted by 226r', 228r' so that the inner and outer metal laminates do not contact each other. According to the presently preferred embodiment, the outer layers may be formed from a metal such as copper, gold, stainless steel, superalloy, or other conducting material. Preferably, the inner surface layer including the cutting edges 226b, 228b are formed from a metal which can be sharpened after the laminating process is completed. The ceramic cores 226r, 228r may be made of aluminum-oxide ceramic and nickel/aluminum coated to aid in bonding with the inner and outer metal laminates.

It will be appreciated that either of the blades 226, 228 from Figures 8 and 9 may be used with an opposed blade 28, 26 from Figures 5 and 6, or with a conventional blade 128 from Figure 7 as explained above with reference to Figure 7.

Figures 10 and 11 show a third embodiment of scissor blades 326, 328. According to this embodiment, both scissor blades 326 and 328 are formed from metallic blades 326f, 328f which include the cutting edges 326b, 328b and shearing faces, and which are coated with a thin non-conductive layer 326r, 328r on their outer surface by gluing, glazing, spraying, depositing, firing, or otherwise fixing the non-conductive layer to the outer surfaces of the blade supports 326f, 328f. An outer metallic conductive layer

or support 326q, 328q is then applied to the non-conductive layer 326r, 328r by gluing, sputtering, metalizing, thermal spraying, plating, or otherwise. The outer metallic layers 326q, 328q form the electrically conductive portions of the blades through which cautery current is applied. As seen in Figure 10, both the insulating coating 326r, 328r and the outer metallic coating 326q, 328q extend along substantially the entire length of the blades so that electrical connection to a source of cautery current may be made at the connecting lug 326e, 328e of the blade to the outer metallic coatings 326q, 328q only. As seen in Figure 11, the path of preferential current flow "E" is through the electrode portions 326q, 328q of the blades which are insulated from the cutting edges and the shearing surfaces of the blades. One advantage of this third embodiment is that the cutting edges 326b, 328b of the scissor blades 326, 328 are part of standard type blades 326f, 328f which are coated. Thus, the feel of the endoscopic bipolar cautery instrument should be substantially the same as the feel of non-cautery endoscopic scissors.

Again, it should be noted that either of the blades 326, 328 of the third embodiment may be utilized with an opposed blade 28, 26, 228, or 226 from Figures 5, 6, 8, and 9, or with a conventional blade 128 from Figure 7 as explained above with reference to Figure 7. It will also be appreciated that although the blades shown herein are relatively flat, curved scissor blades

such as those shown in the copending application Serial No. 08/284,793 may be used instead.

A fourth embodiment of scissor blades 426, 428 is shown in Figures 12 and 13. The first scissor blade 426 has a curved distal portion 426a, a lower proximal tang 426c, and a mounting hole 426d therebetween. A connecting lug 426e extends orthogonally outward from the surface of the tang 426c in a first direction. As shown in Figures 12 and 13, the distal portion 426a includes a lower cutting edge 426b and an inner or shearing surface 426f. Behind the inner surface 426f of the first scissor blade is an insulating layer 426r, and a conducting electrode layer 426g. The opposed second scissor blade 428 is configured similarly to the first scissor blade and has a curved distal portion 428a, an upper proximal tang 428c, and a mounting hole 428d therebetween. A connecting lug 428e extends orthogonally from the surface of the tang 428c in a second direction which is opposite to the first direction mentioned above. The distal portion 428a includes a upper cutting edge 428b and an inner surface 428f. Behind the inner surface 428f of the second scissor blade 428 is an insulating layer 428r, and a conducting electrode layer 428g.

According to this fourth embodiment, both blades 426 and 428 are laminated assemblies having a non-conductive core 426r, 428r.

The core 426r, 428r is preferably formed from a fiberglass or a similar material and includes the curved distal portion 426a, 428a, the proximal tang 426c, 428c, and the mounting hole 426d, 428d. A metal blade layer 426f, 428f defining a shearing surface is laminated to the inner surface of the non-conductive core 426r, 428r along the curved distal portion 426a, 428a. It will be appreciated that the metal blade layers 426f, 428f are preferably provided with sharpened opposing cutting edges 426b, 428b. An outer metallic support layer 426g, 428g is laminated to the outer surface of the non-conductive core 426r, 428r from the mounting hole 426d, 428d along the curved distal portion 426a, 428a. The outer metallic support layers 426g, 428g form the electrically conductive portions of the blades through which cautery current is applied. Thus, the outer metallic support layer 426g, 428g extends along substantially the entire length of the core 426r, 428r to make and electrical connection at the lug 426e, 428e as described above with reference to Figures 3-4c. As seen in Figure 14, the path of preferential current flow "E" is through portions 426g, 428g of the blades which are insulated from the cutting edges and the shearing surfaces of the blades. It should be noted that the laminated blades of the fourth embodiment can be made more flexible than the blades of the other embodiments. It should also be noted that the laminated blades of the fourth embodiment could be provided as straight blades. Further, it will be appreciated that a straight or curved blade of the fourth

embodiment can be used with any of the blades of the first, second, or third embodiments, or with a conventional blade such as shown in Fig. 7.

There have been described and illustrated herein several embodiments of bipolar endoscopic surgical scissor blades and an instrument incorporating them. While particular embodiments of the invention have been described, it is not intended that the invention be limited thereto, as it is intended that the invention be as broad in scope as the art will allow and that the specification be read likewise. Thus, while particular conductive and non-conductive materials have been disclosed, it will be appreciated that other materials could be utilized. Also, while blades of specific shape and dimension have been shown, it will be recognized that blades having different shapes and dimensions could be used with similar results obtained. While means for pivotally joining the blades has been shown as an axle screw with a nut, other pivotal joining means could be used. For example, a clevis with an integral axle pin, or a snap-in axle pin, or a riveted axle pin could all be used. While means for supplying each blade with a voltage has been shown as a bipolar push rod, it will be appreciated that other means such as a bipolar clevis and bipolar hollow tube could be used. Individual shielded electrical conductors within the hollow tube could also be used for this purpose. In addition, while the electrical coupling of the

conductive portion of each blade has been shown as the proximal connecting lug which connects to a link, it will be appreciated that an electrical coupling could be made through a two piece bipolar clevis axle. Also, while the means for imparting scissor-like movement to the blades has been shown as a push rod, a pull wire or other reciprocating arrangement might be used as well. In addition, while the means for coupling the scissor blades to the push rod has been shown as an orthogonal lug, it will be understood that other means such as a connecting hole could be used while achieving substantially the same results. Moreover, while particular methods have been disclosed in reference to laminating conductive and non-conductive layers, it will be appreciated that other methods could be used as well.

Claims:

1. A bipolar electrosurgical instrument for cutting and coagulating tissue comprising:
 - (a) first and second blade members each comprising a laminated assembly of a metal blade defining a shearing surface, a metal blade support and an intermediate electrically insulative bonding/spacing layer for joining said blade to said blade support;
 - (b) means for pivotally joining said first and second blade members together with their respective shearing surfaces facing one another;
 - (c) means coupled to at least one of said first and second blade members for imparting a scissors-like movement relative to the other of said first and second blade members; and
 - (d) means for applying a voltage between the metal blade supports of said first and second blade members.
2. The bipolar electrosurgical instrument as in claim 1 wherein said shearing surfaces of said first and second blade members and said blade support are curved.
3. The bipolar electrosurgical instrument as in claim 2 wherein said intermediate, electrically insulating bonding/spacing layer is an epoxy material.

4. The bipolar electrosurgical instrument as in claim 3 wherein said epoxy material includes a fiberglass-mat of a predetermined thickness therein.
5. The bipolar electrosurgical instrument as in claim 3 wherein said metal is stainless steel.

6. A bipolar electrosurgical instrument for cutting and coagulating tissue comprising, in combination:

- (a) an elongated tubular member having a proximal end, a distal end and a lumen extending therebetween;
- (b) first and second blade members each comprising a laminated assembly of a metal blade defining a shearing surface, a metal blade support and an intermediate electrically insulative bonding/spacing layer for joining said blade to said blade support;
- (c) means for pivotally joining said first and second blade members to the distal end of said elongated tubular member with their respective shearing surfaces facing one another;
- (d) a handle affixed to said proximal end of said tubular member;
- (e) means coupled to said handle and extending through said lumen for imparting a scissors-like movement to at least one of said first and second blade members relative to the other; and
- (f) means extending through said lumen for applying a voltage between said blade supports of said first and second blade members.

7. The bipolar electrosurgical instrument as in claim 6 wherein said intermediate electronically insulating bonding layer is an epoxy material.

8. The bipolar electrosurgical instrument as in claim 7 wherein said epoxy material includes a fiberglass mat of a predetermined thickness therein.
9. The bipolar electrosurgical instrument as in claim 6 wherein said first and second blade members are curved.
10. A bipolar electrosurgical instrument for cutting and coagulating tissue, comprising:
 - a) first and second blade members each comprising a laminated assembly of a metal blade defining a shearing surface, an intermediate electrically insulative layer, and a metal blade support which is electrically insulated from said metal blade by said intermediate electrically insulative layer;
 - b) means for pivotally joining said first and second blade members together with their respective shearing surfaces facing one another;
 - c) means coupled to at least one of said first and second blade members for imparting a scissors-like movement relative to the others of said first and second blade members; and
 - d) means for applying a voltage between the metal blade supports of said first and second blade members.

11. A bipolar electrosurgical instrument according to claim 10,
wherein:

 said shearing surfaces of said first and second blade members
and said blade support are curved.

12. A bipolar electrosurgical instrument according to claim 11,
wherein:

 said metal is stainless steel.

13. A bipolar electrosurgical instrument for cutting and coagulating tissue, comprising, in combination:

- a) an elongated tubular member having a proximal end, a distal end, and a lumen extending therebetween;
- b) first and second blade members, each comprising a laminated assembly of a metal blade defining a shearing surface, an intermediate electrically insulative layer, and a metal blade support which is electrically insulated from said metal blade by said intermediate electrically insulative layer;
- c) means for pivotally joining said first and second blade members together with their respective shearing surfaces facing one another;
- d) a handle affixed to said proximal end of said tubular member;
- e) means coupled to said handle and extending through said lumen for imparting a scissors-like movement to at least one of said first and second blade members relative to the other; and
- f) means extending through said lumen for applying a voltage between said blade supports of said first and second blade members.

14. A bipolar electrosurgical instrument for cutting and coagulating tissue, comprising:

- a) first and second blade members each having an inner shearing surface and a conductive portion, at least one of said blade members comprising a laminated assembly of an inner metal blade defining said inner shearing surface, an intermediate electrically insulative layer, and an outer metal conductive layer forming said conductive portion which is electrically insulated from said inner metal blade by said intermediate electrically insulative layer;
- b) means for pivotally joining said first and second blade members with their respective inner shearing surfaces facing one another;
- c) means coupled to at least one of said first and second blade members for imparting a scissors-like movement relative to the others of said first and second blade members; and
- d) means for applying a voltage between said outer conductive portions of said first and second blade members.

15. A bipolar electrosurgical instrument according to claim 14, wherein:

 said inner shearing surfaces of said first and second blade members are curved.

16. A bipolar electrosurgical instrument according to claim 14, wherein:

said metal is stainless steel.

17. A bipolar electrosurgical instrument according to claim 14, wherein:

each of said first and second blades members comprises a laminated assembly of an inner metal blade defining said inner shearing surface, an intermediate electrically insulative layer, and an outer metal conductive layer forming said conductive portion which is electrically insulated from said inner metal blade by said intermediate electrically insulative layer.

18. A bipolar electrosurgical instrument according to claim 14, wherein:

said intermediate electrically insulative layer is a ceramic element and said inner metal blade and said outer metal conductive layer are affixed layers on said ceramic element.

19. A bipolar electrosurgical instrument according to claim 14, wherein:

said outer metal conductive layer is a relatively thick metal support member, said intermediate electrically insulative layer is a ceramic layer affixed to said support member, and said inner metal blade is a metal layer affixed on said ceramic layer.

20. A bipolar electrosurgical instrument for cutting and coagulating tissue, comprising, in combination:

- a) an elongated tubular member having a proximal end, a distal end, and a lumen extending therebetween;
- b) first and second blade members each having an inner shearing surface and a conductive portion, at least one of said blade members comprising a laminated assembly of an inner metal blade defining said inner shearing surface, an intermediate electrically insulative layer, and an outer metal conductive layer forming said conductive portion which is electrically insulated from said inner metal blade by said intermediate electrically insulative layer;
- c) means for pivotally joining said first and second blade members with their respective inner shearing surfaces facing one another;
- d) a handle affixed to said proximal end of said tubular member;
- e) means coupled to said handle and extending through said lumen for imparting a scissors-like movement to at least one of said first and second blade members relative to the other; and
- f) means extending through said lumen for applying a voltage between said conductive portions of said first and second blade members.

21. A bipolar electrosurgical instrument according to claim 20, wherein:

each of said first and second blades members comprises a laminated assembly of an inner metal blade defining said inner shearing surface, an intermediate electrically insulative layer, and an outer metal conductive layer forming said conductive portion which is electrically insulated from said inner metal blade by said intermediate electrically insulative layer.

22. A bipolar electrosurgical instrument according to claim 20, wherein:

said intermediate electrically insulative layer is a ceramic member and said inner metal blade and said outer metal conductive layer are metal layers affixed to said ceramic member.

23. A bipolar electrosurgical instrument according to claim 20, wherein:

said outer metal conductive layer is a relatively thick metal support member, said intermediate electrically insulative layer is a ceramic layer affixed to said support member, and said inner metal blade is a metal layer affixed to said ceramic layer.

24. An endoscopic scissor blade for use in a bipolar endoscopic instrument, said blade comprising:

- a) an inner metal shearing surface;
- b) an intermediate electrically insulative layer;
- c) an outer metal conductive layer which is electrically insulated from said inner metal shearing surface by said intermediate electrically insulative layer; and
- d) means for coupling a source of voltage to said outer metal conductive layer.

25. An endoscopic scissor blade according to claim 24, further comprising:

- e) means for pivotally mounting said scissor blade; and
- f) means for coupling said scissor blade to a means for imparting a pivotal movement to said scissor blade.

26. An endoscopic scissor blade according to claim 24, wherein:

said intermediate electrically insulative layer is a ceramic member and said inner metal shearing surface and said outer metal conductive layer are metal layers affixed on said ceramic member.

27. An endoscopic scissor blade according to claim 24, wherein:
said outer metal conductive layer is a relatively thick support member, said intermediate electrically insulative layer is a ceramic layer affixed to the support member, and said inner metal blade is a metal layer affixed to said ceramic layer.

28. An endoscopic scissor blade according to claim 24, wherein:
said intermediate electrically insulative layer is a fiberglass blade support and said inner metal shearing surface and said outer metal conductive layer are laminated layers on said fiberglass blade support.

29. An endoscopic scissor blade according to claim 24, wherein:
said intermediate electrically insulative layer is a thin coating on said inner metal shearing surface and said outer metal conductive layer is a thin metal coating affixed to said insulative layer.

30. A bipolar electrosurgical scissors comprising:

- a) first and second blade members each comprising an assembly of a metal shearing surface, an electrically conductive electrode, and an intermediate electrically insulative material disposed between and fixed to the metal shearing surface and the electrically conductive electrode;
- b) means coupled to at least one of said first and second blade members for imparting scissors-like movement relative to the other of said first and second blade members; and
- c) means for applying a voltage between the electrically conductive electrodes of said first and second blade members.

31. A bipolar electrosurgical scissors according to claim 30, wherein:

 said metal shearing surfaces of said first and second blade members are curved.

32. A bipolar electrosurgical scissors according to claim 31, wherein:

 said intermediate, electrically insulative material is an epoxy material.

33. A bipolar electrosurgical scissors according to claim 32,
wherein:

 said epoxy material includes a fiberglass-mat of a
predetermined thickness therein.

34. A bipolar electrosurgical scissors according to claim 32
wherein:

 at least one of said metal shearing surface and said
electrically conductive electrode is made of stainless steel.

35. A bipolar electrosurgical scissors comprising:

- a) first and second blade members each comprising an assembly of a metal shearing surface, an electrically conductive electrode, and an intermediate electrically insulative layer disposed between and affixed to the metal shearing surface and the electrically conductive electrode, at least one of said first and second blade members having a pivot hole for mounting it relative to the other of said first and second blade members to allow a scissor-like movement of said at least one of said first and second blade members relative to the other of said first and second blade members;
- b) a reciprocating member coupled to said at least one of said first and second blade members and imparting scissor-like movement to said at least one of said first and second blade members relative to the other of said first and second blade members; and
- c) first and second electrically conductive members coupled to respective electrically conductive electrodes and applying a voltage between the electrically conductive electrodes of said first and second blade members.

36. A bipolar electrosurgical scissors according to claim 35, wherein:

said metal shearing surfaces of said first and second blade members are curved.

37. A bipolar electrosurgical scissors according to claim 36,
wherein:

 said intermediate, electrically insulative layer is an epoxy
material layer.

38. A bipolar electrosurgical scissors according to claim 37,
wherein:

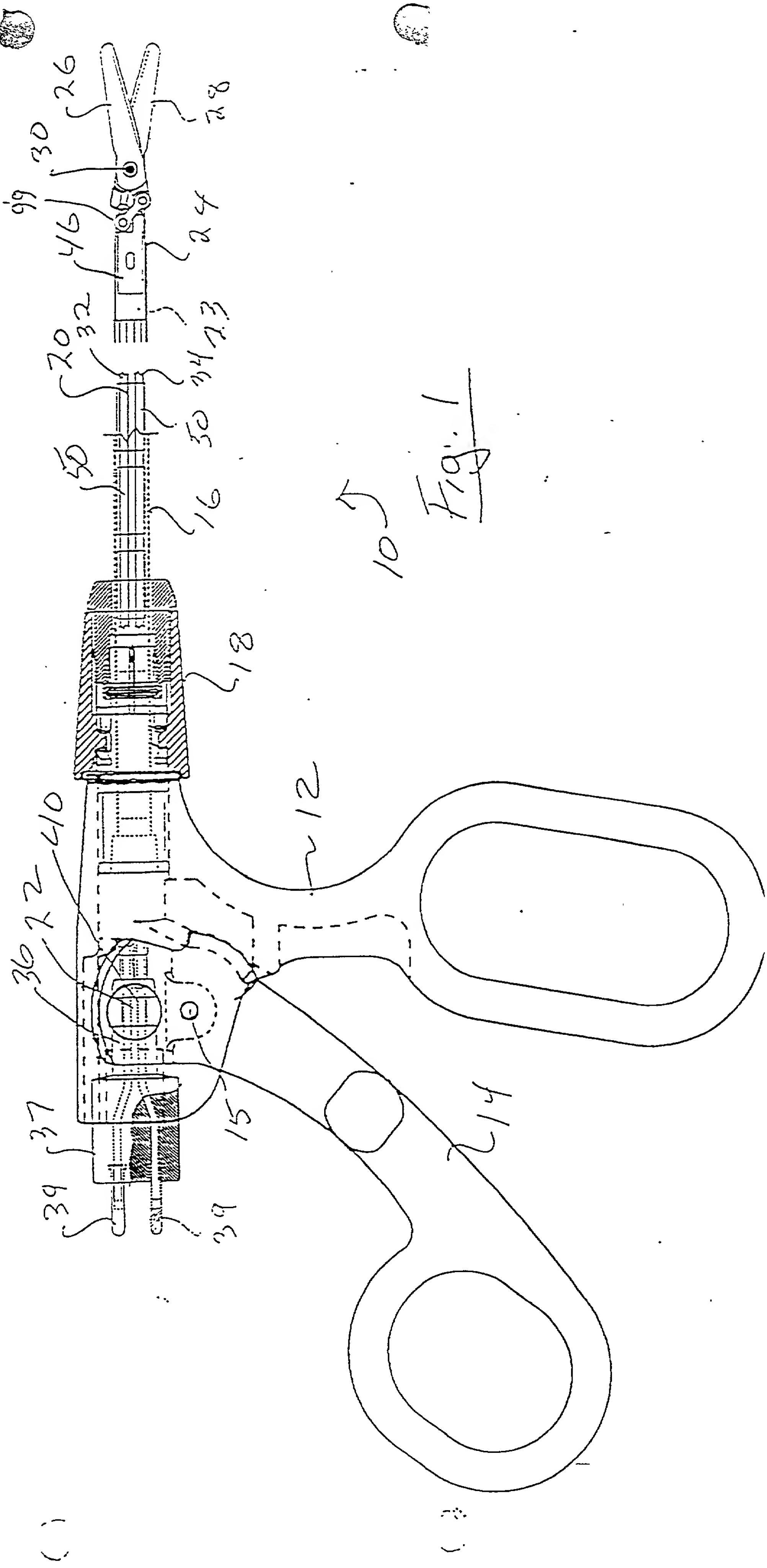
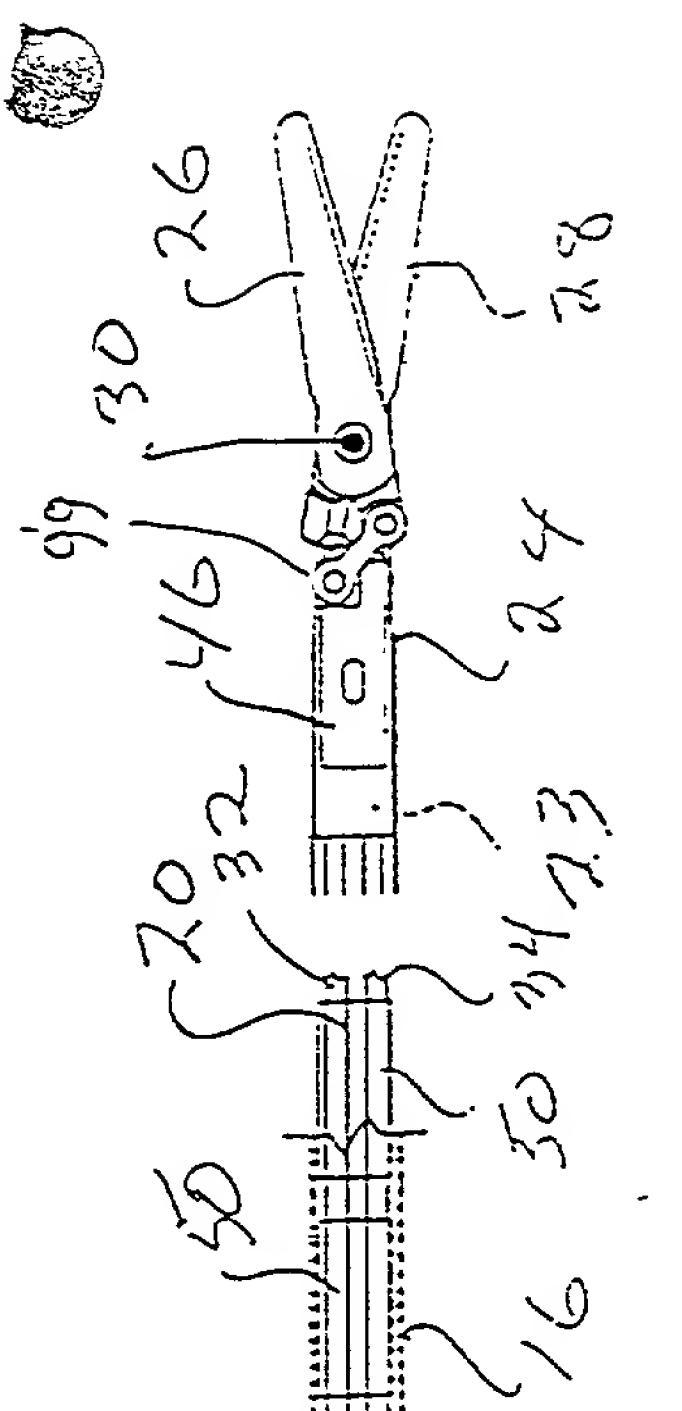
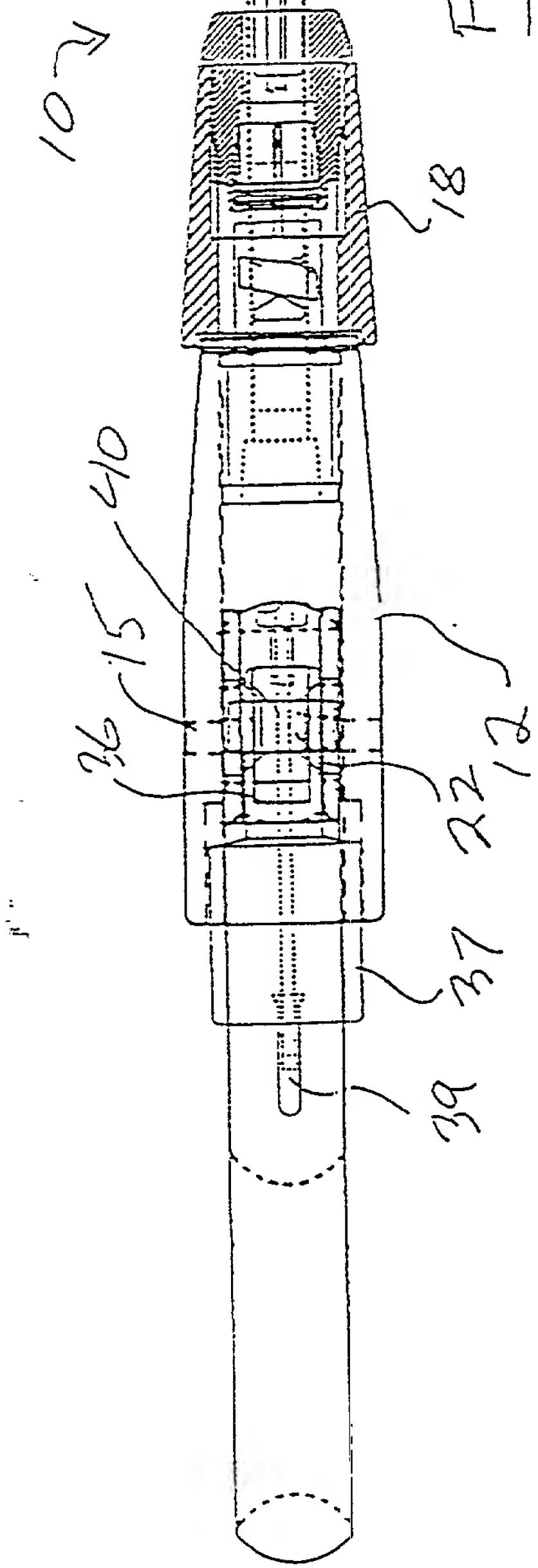
 said epoxy material includes a fiberglass-mat of a
predetermined thickness therein.

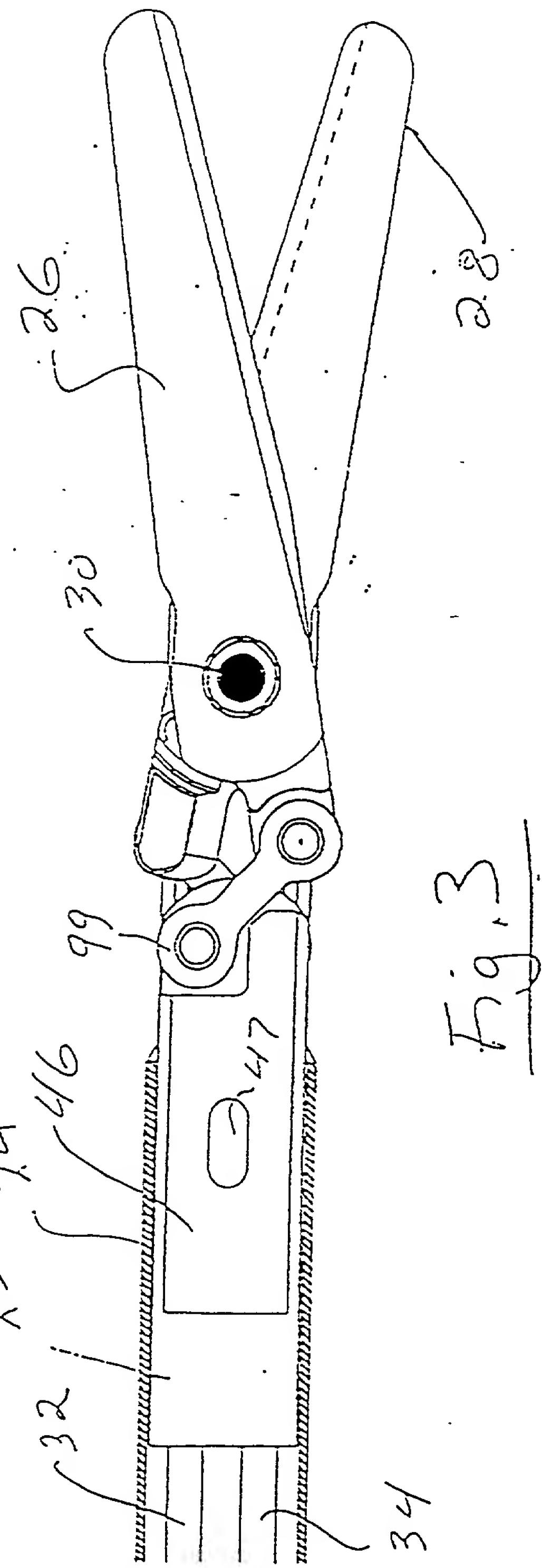
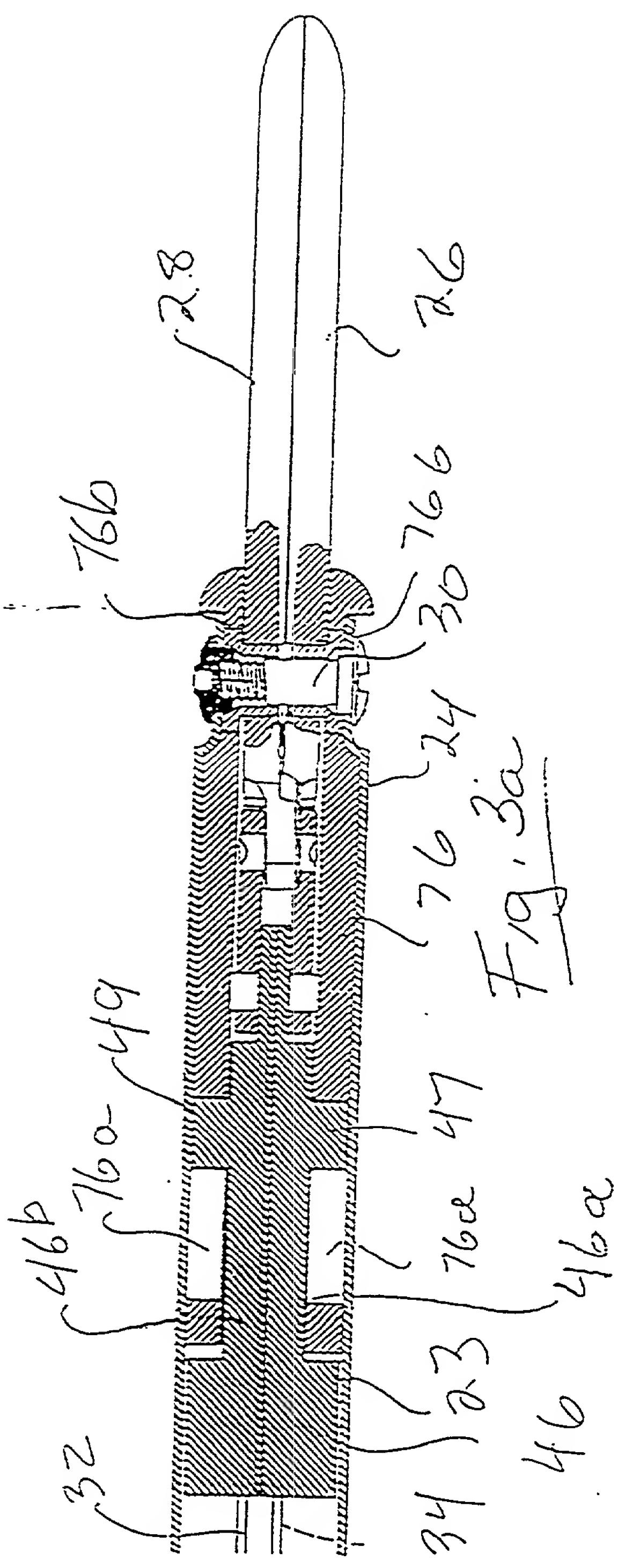
39. A bipolar electrosurgical scissors according to claim 37,
wherein:

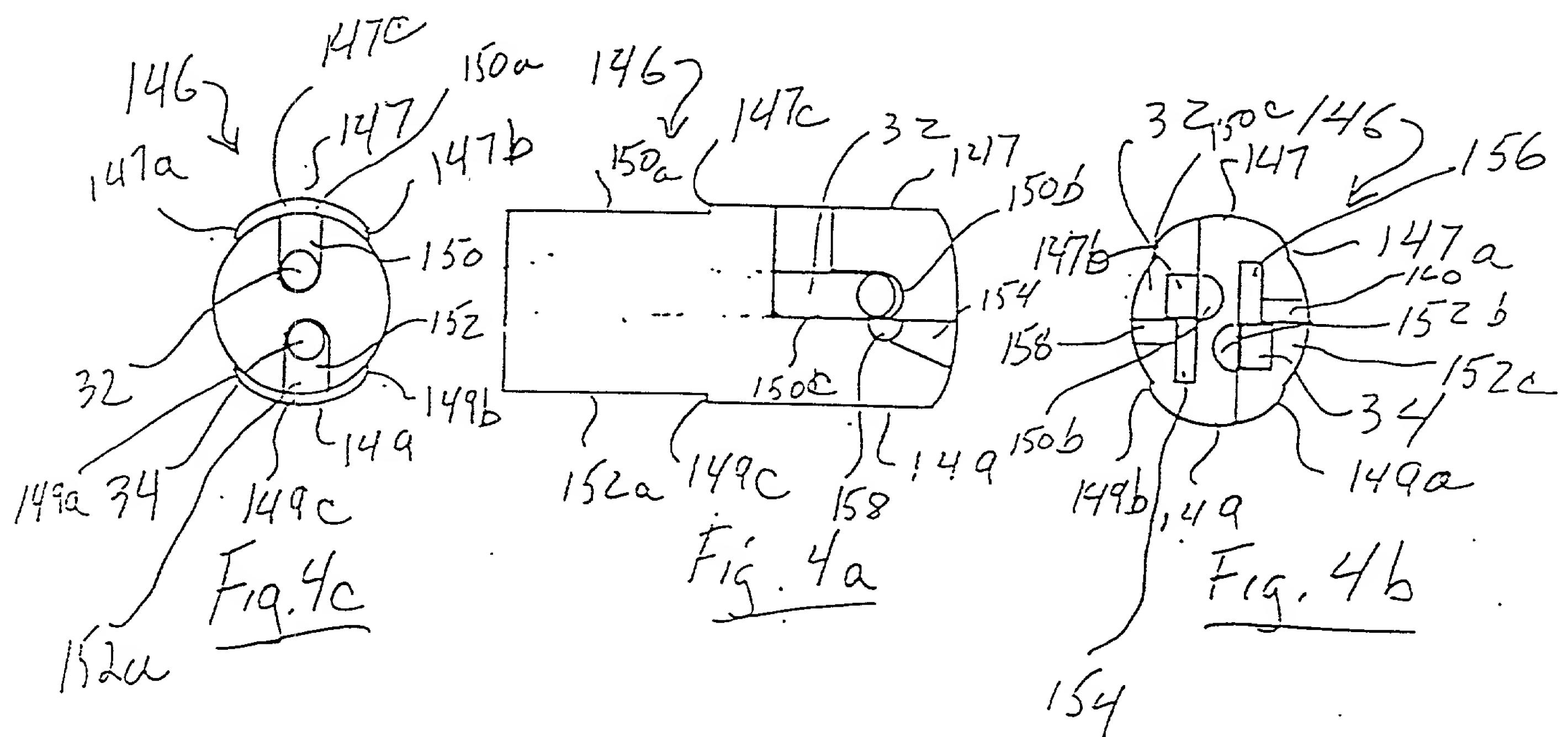
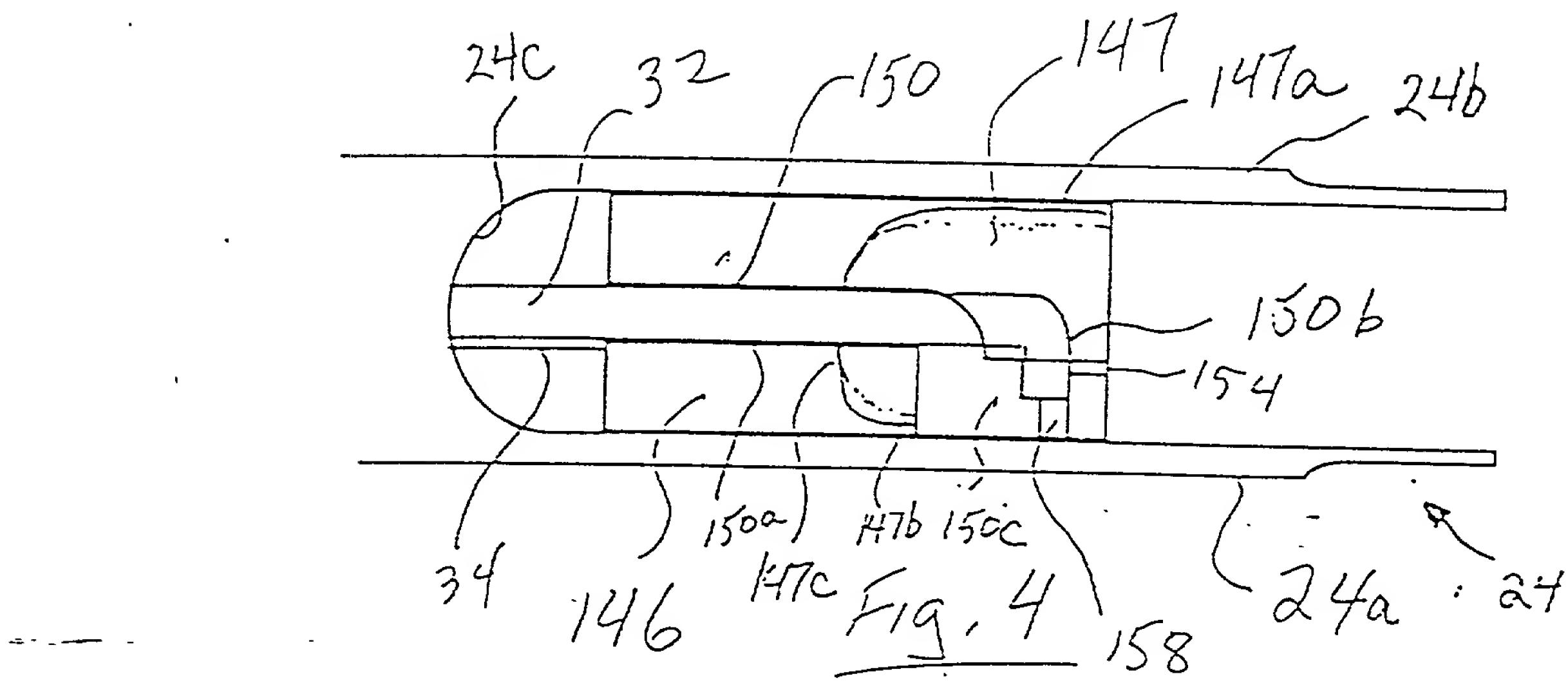
 at least one of said metal shearing surface and said
electrically conductive electrode is made of stainless steel.

ABSTRACT OF THE DISCLOSURE

Endoscopic bipolar scissor blades are formed in a laminate assembly of an electrically conductive electrode, an electrically insulating material, and a metal shearing surface which is electrically insulated and physically spaced from the electrode by the insulating material which is disposed therebetween. In one embodiment, the electrode is a metal blade, while the insulating material is a ceramic which is fixed to the metal blade, and the metal shearing surface which also provides the cutting edge is of a metal material which is fixed to the ceramic. In a second embodiment, the insulating material is a molded ceramic blade, with the electrode and the metal shearing surface layer metalized or otherwise fixed to the ceramic blade. In a third embodiment, the electrode is metalized on a thin layer insulating material which is fixed onto a metallic blade. In a fourth embodiment, metallic shearing and electrode layers are laminated to opposite sides of a fiberglass material. In all embodiments, the metal cutting edges and surfaces are insulated from the electrodes, and no short circuit can form between the electrodes even though the cutting edges and shearing surfaces are metal.







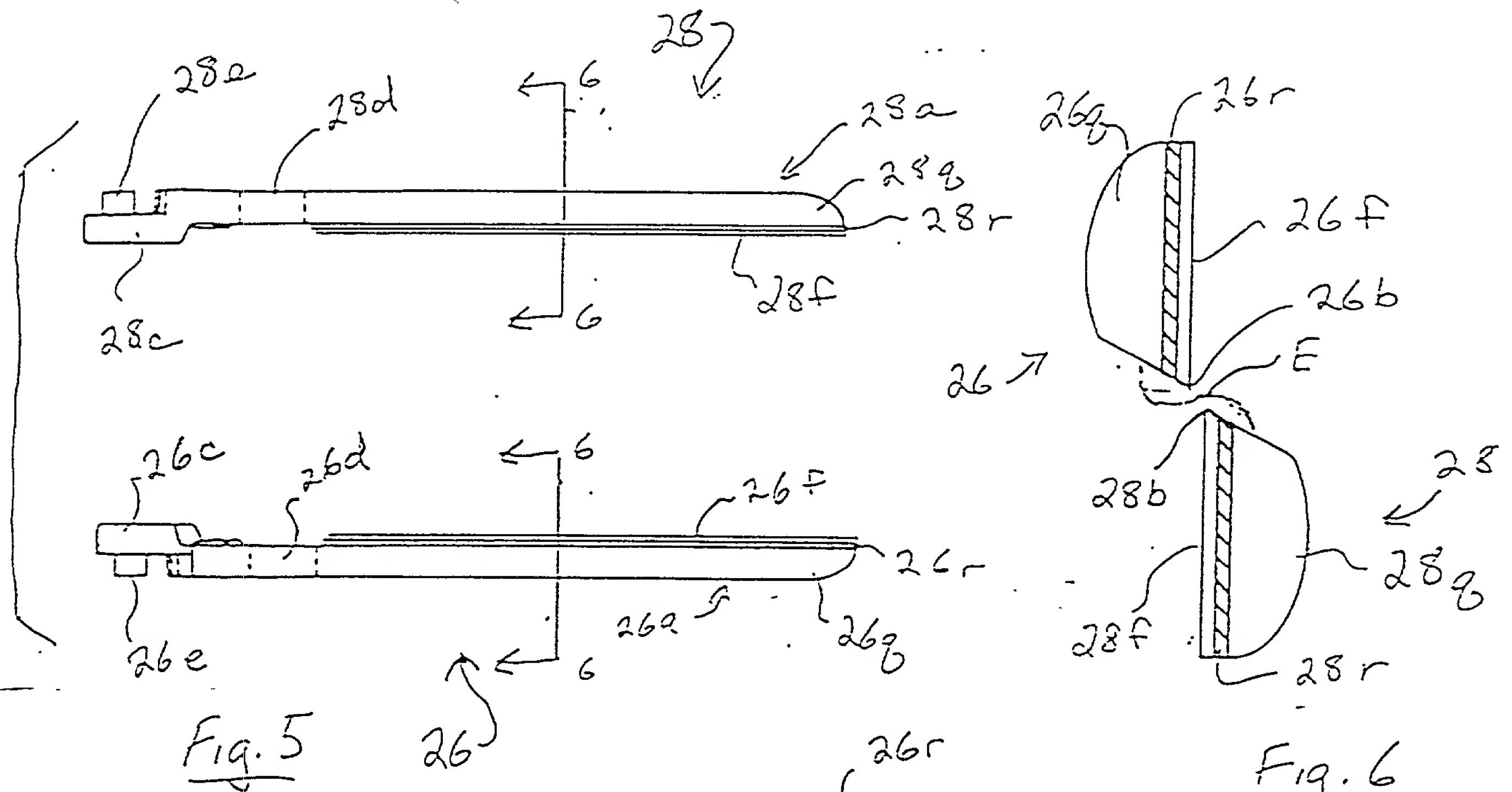


Fig. 5

Fig. 6

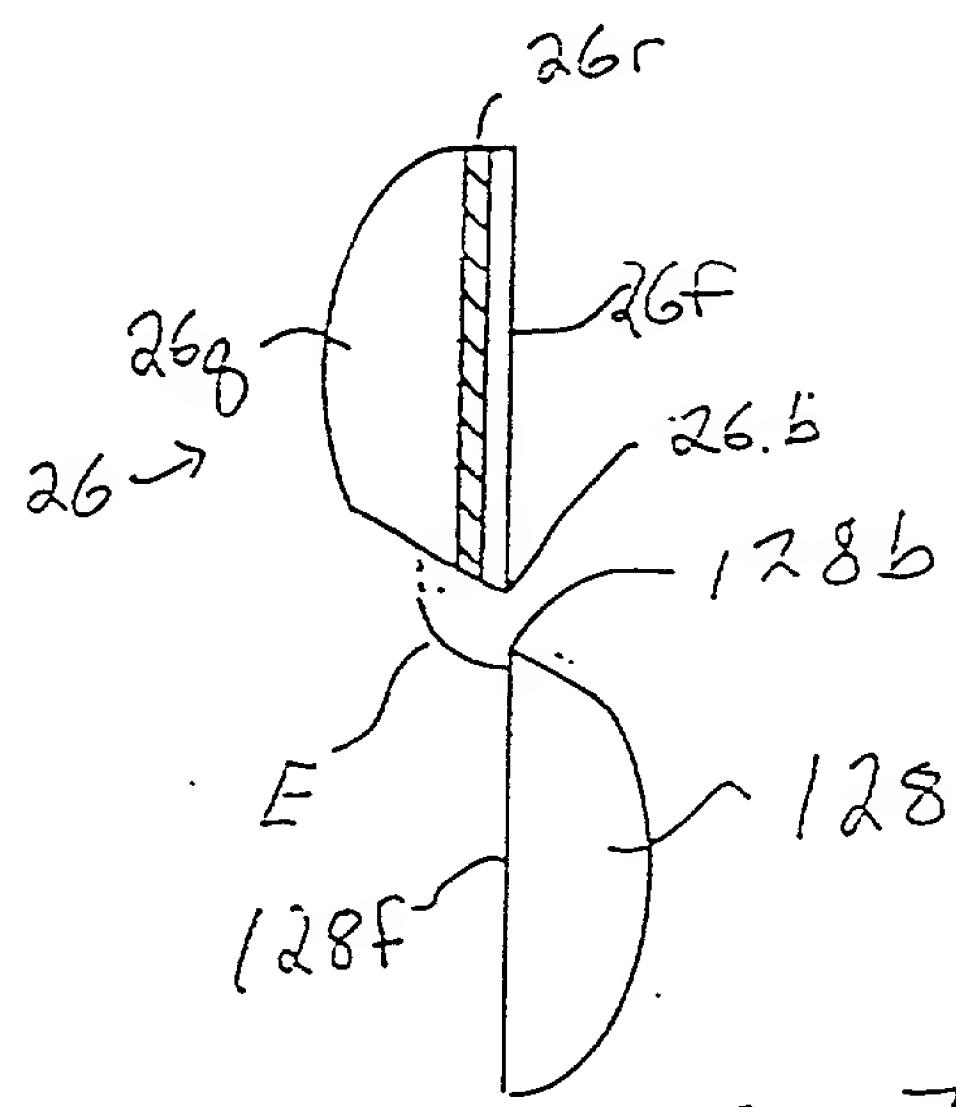


Fig. 7

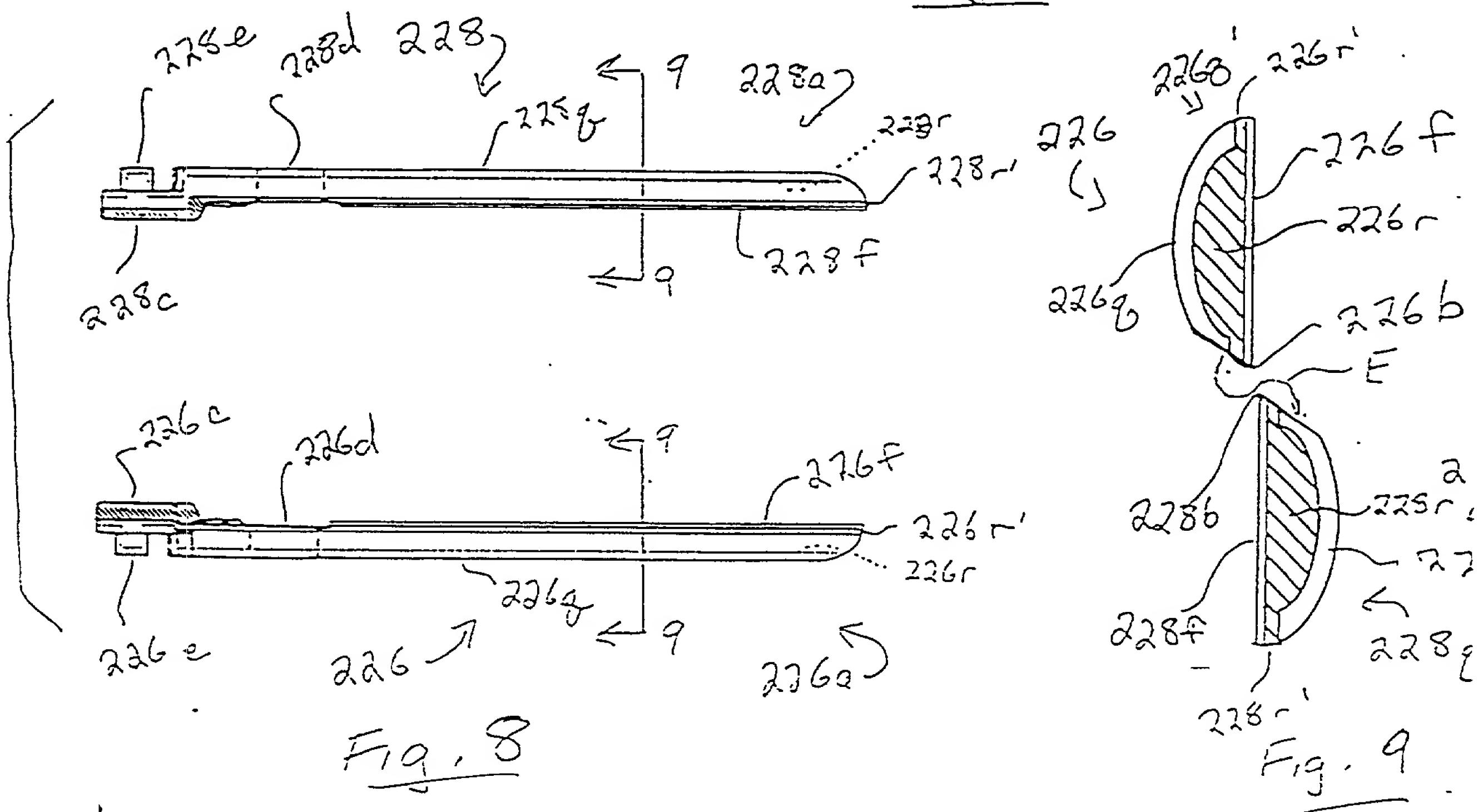
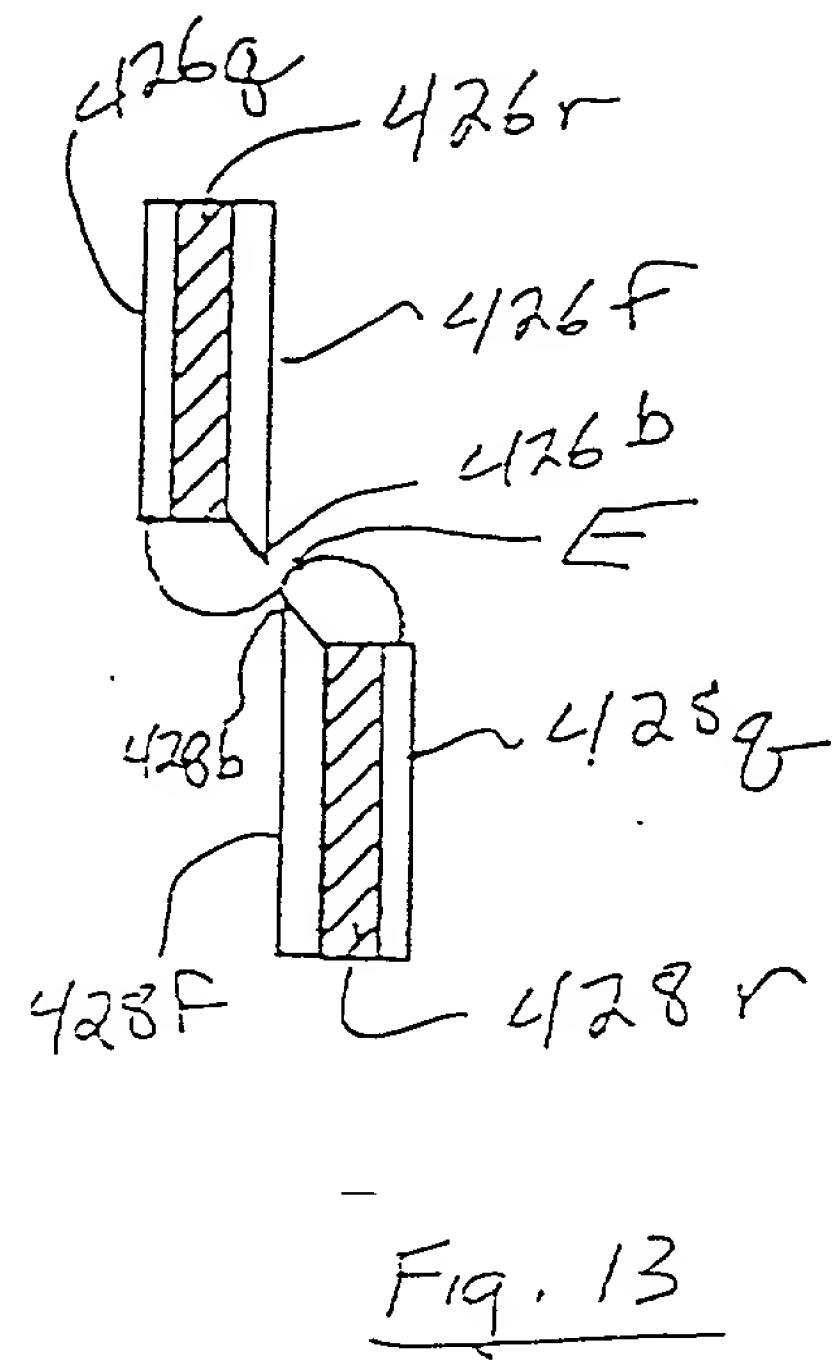
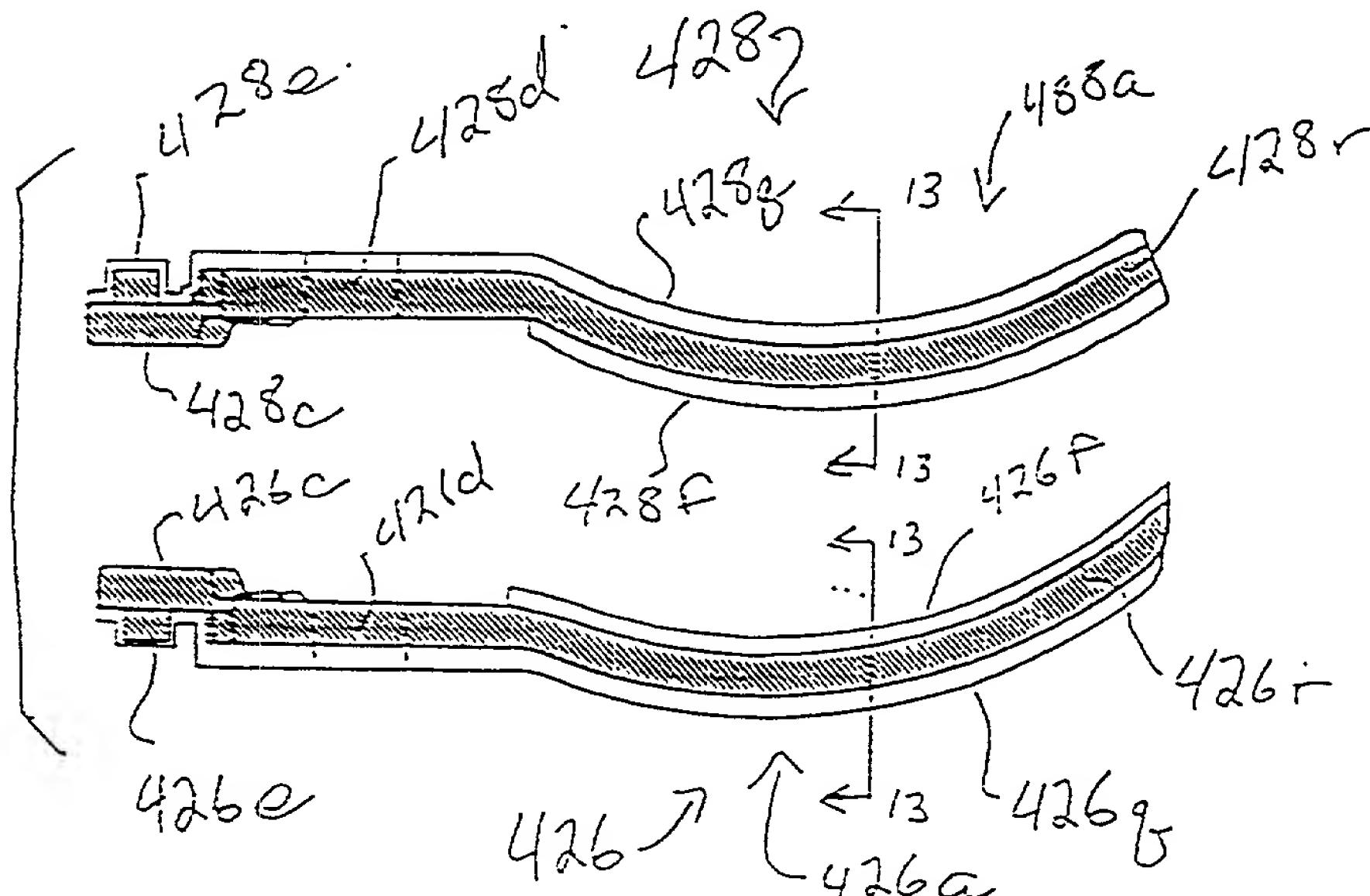
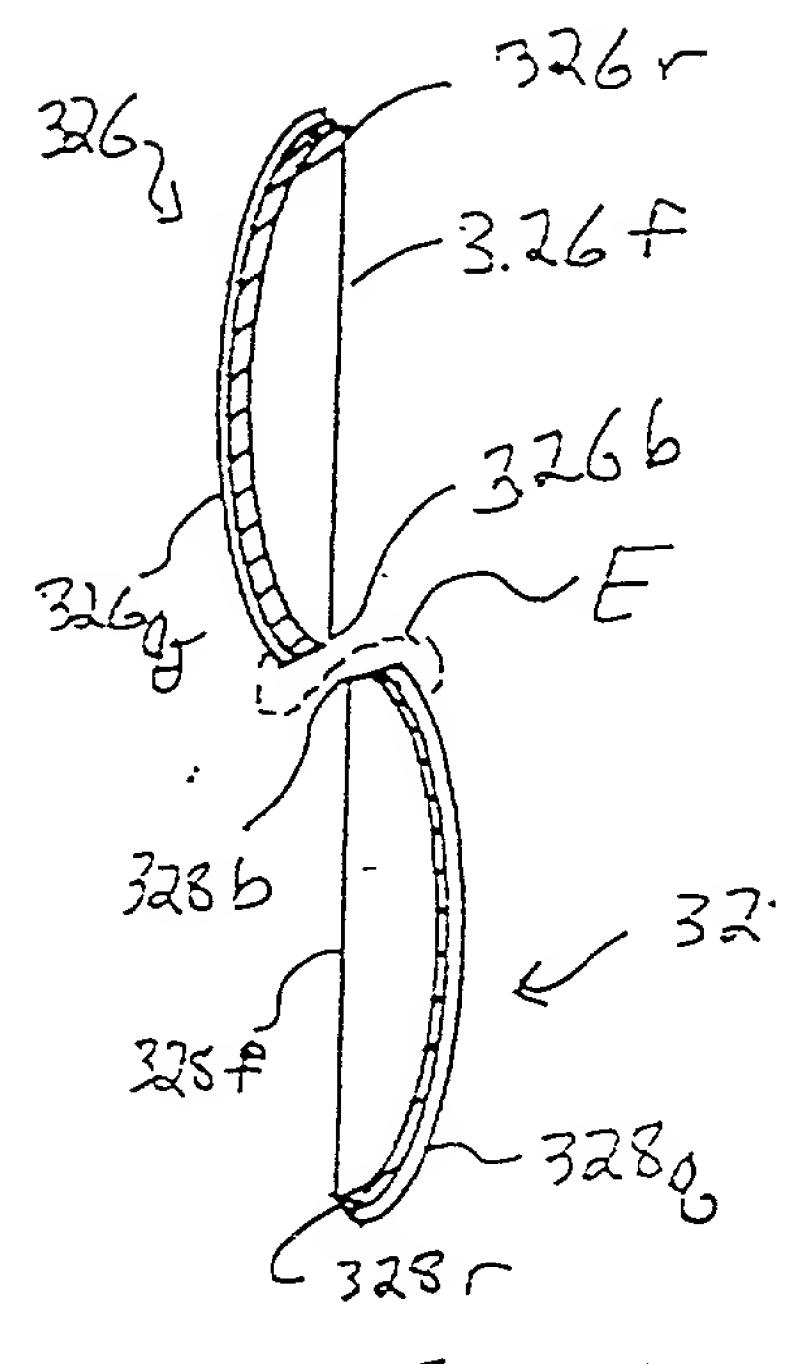
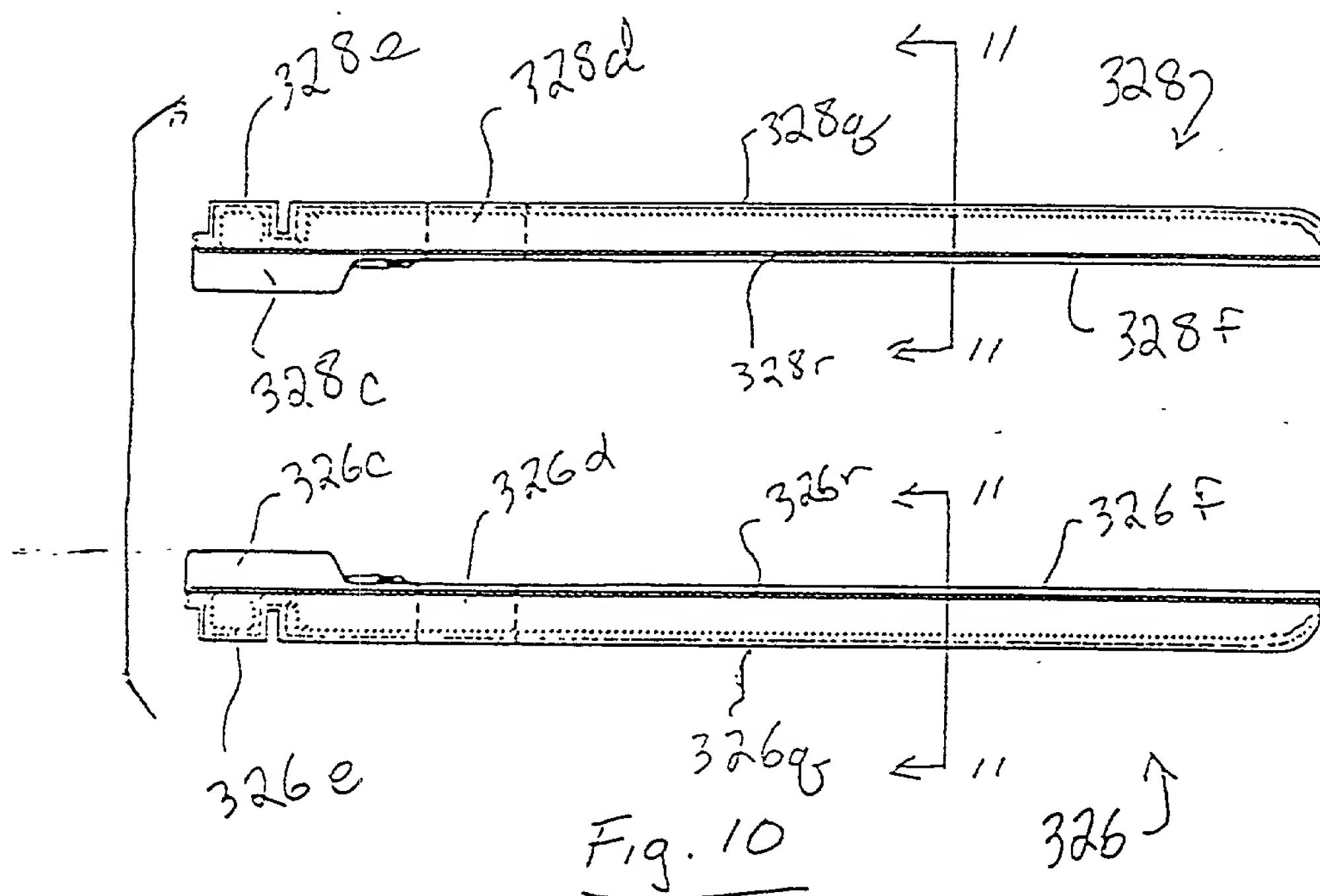


Fig. 8

Fig. 9



DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

As below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name, and

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed for and for which a patent is sought on the invention entitled

BIPOLAR ENDOSCOPIC SURGICAL SCISSOR BLADES AND INSTRUMENT INCORPORATING THE SAME, the specification of which

is attached hereto.

was filed on _____
as application Serial Number _____
and was amended on (if applicable) _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by an amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)Priority Claimed

(Number)	(Country)	/ / D/M/YR FILED	<input type="checkbox"/> YES <input type="checkbox"/> NO
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(Number)	(Country)	/ / D/M/YR FILED	<input type="checkbox"/> YES <input type="checkbox"/> NO
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I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Ser. No) (Filing Date) (Status-Patented, pending, abandoned)

(Application Ser. No) (Filing Date) (Status-Patented, pending, abandoned)

As a named inventor, I hereby appoint the following attorney(s) and/or agent to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

David P. Gordon (29,996)
Egon E. Berg (21,117)
Ronald W. Alice (27,609)
Stanley N. Garber (22,385)
Andrew J. Beck (21,142)
Albert J. Santorelli (22,610)

Montgomery W. Smith (31,141)
Richard D. Allison (31,584)
Gene B. Kartchner (33,140)
Curtis D. Kinghorn (33,926)
David A. Warmbold (30,897)

Address all correspondence to

David P. Gordon, Esq.
65 Woods End Road
Stamford, Connecticut 06905
U.S.A.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SOLE OR FIRST INVENTOR

Signature

Charles R. Slater

Date

12-12-94

Full Name Charles R. Slater

Residence 1705 S.W. 4th Street, Fort Lauderdale, FL 33312

Citizenship U.S.A.

P.O. Address same as residence